United States Patent

Willett

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[54] **AUTOMATIC BAG CLOSING MACHINE**

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[52] **U.S. Cl.** **53/76,** 53/373

[51] **Int. Cl.** **B65b 57/00**

[58] **Field of Search** 53/75, 76

[56] **References Cited**

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3,183,639	5/1965	Rodman	53/75
3,381,448	5/1968	Ayres et al.	53/373
3,200,558	8/1965	Adams et al.	53/76
3,425,183	2/1969	Ayres et al.	53/76

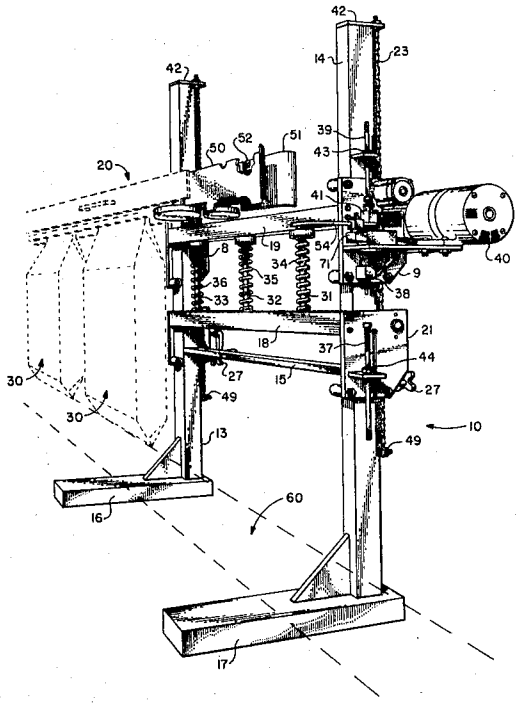
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[57] **ABSTRACT**

Pinch-style multi-wall bags are sealed with an automatic bag closing machine wherein the sealing unit is mounted on a framework which permits up and down movement thereof. The sealing unit is resiliently mounted to move in a vertical plane so as to accommodate bags of slightly varying height. A mechanically driven gear system is employed for orienting the sealing unit, and an electronic sensing device is arranged for sensing the presence of a bag to be sealed and for triggering the movement of the sealing unit to the proper bag height.

4 Claims, 4 Drawing Figures



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SHEET 1 OF 4

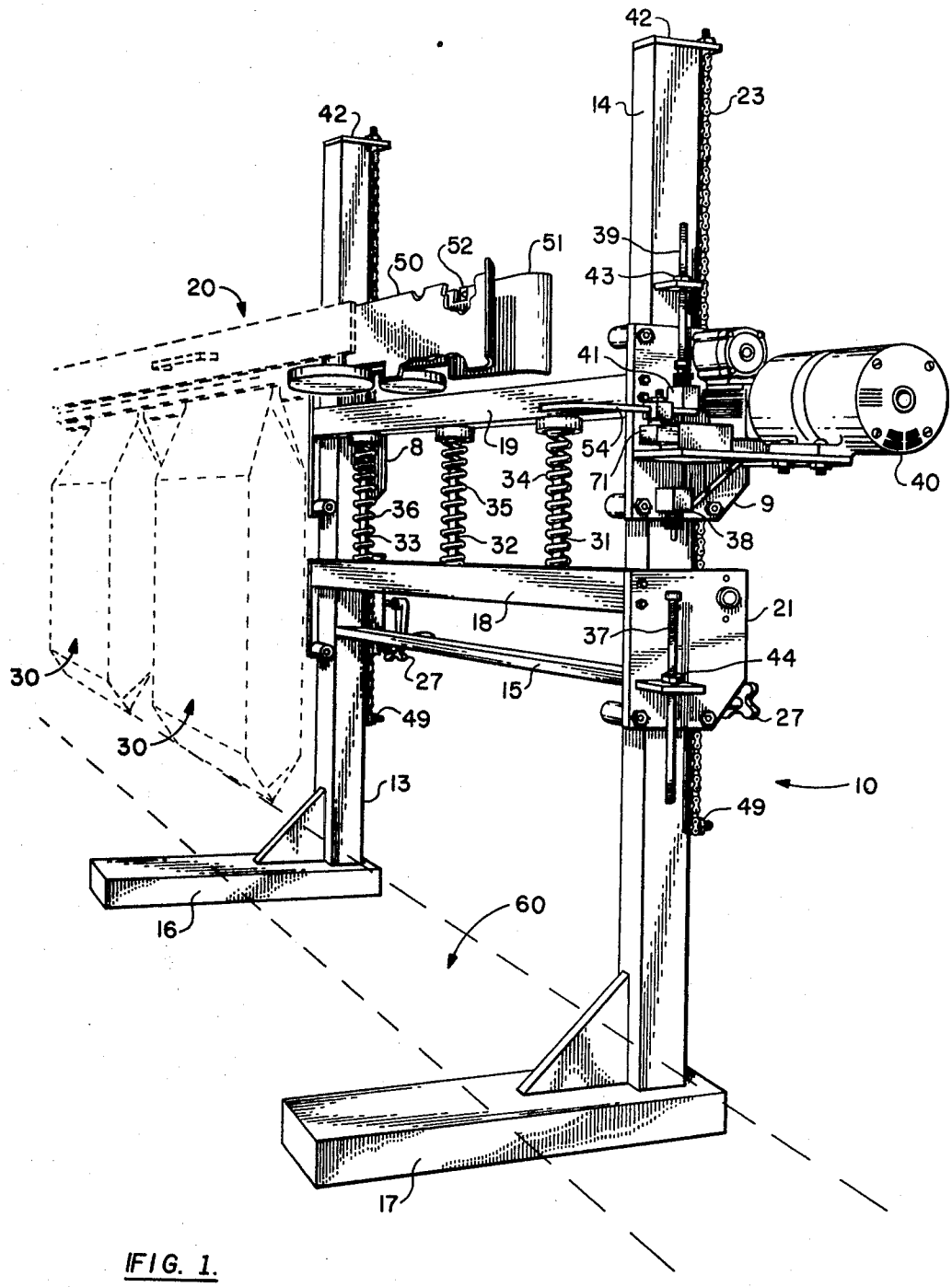


FIG. 1.

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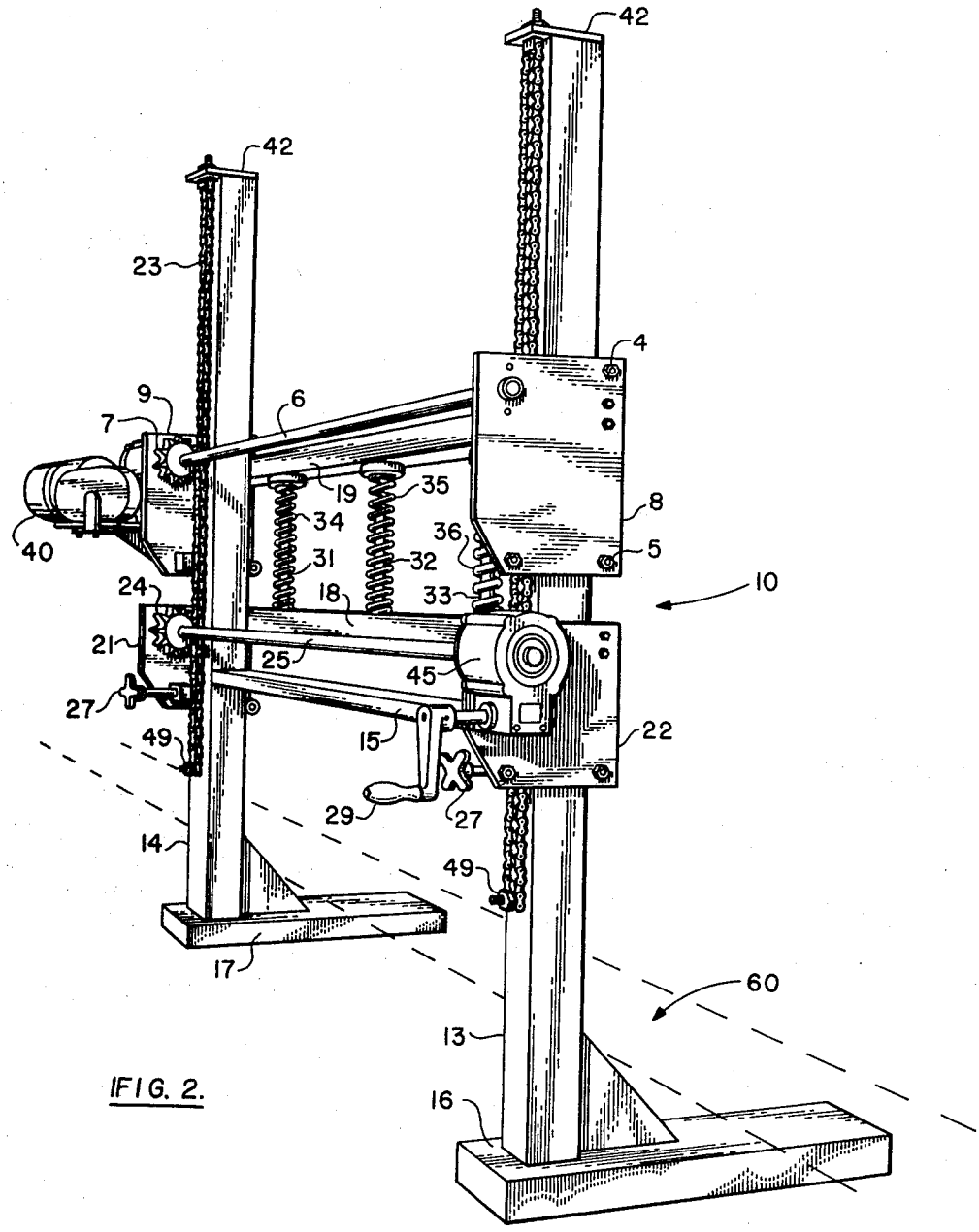


FIG. 2.

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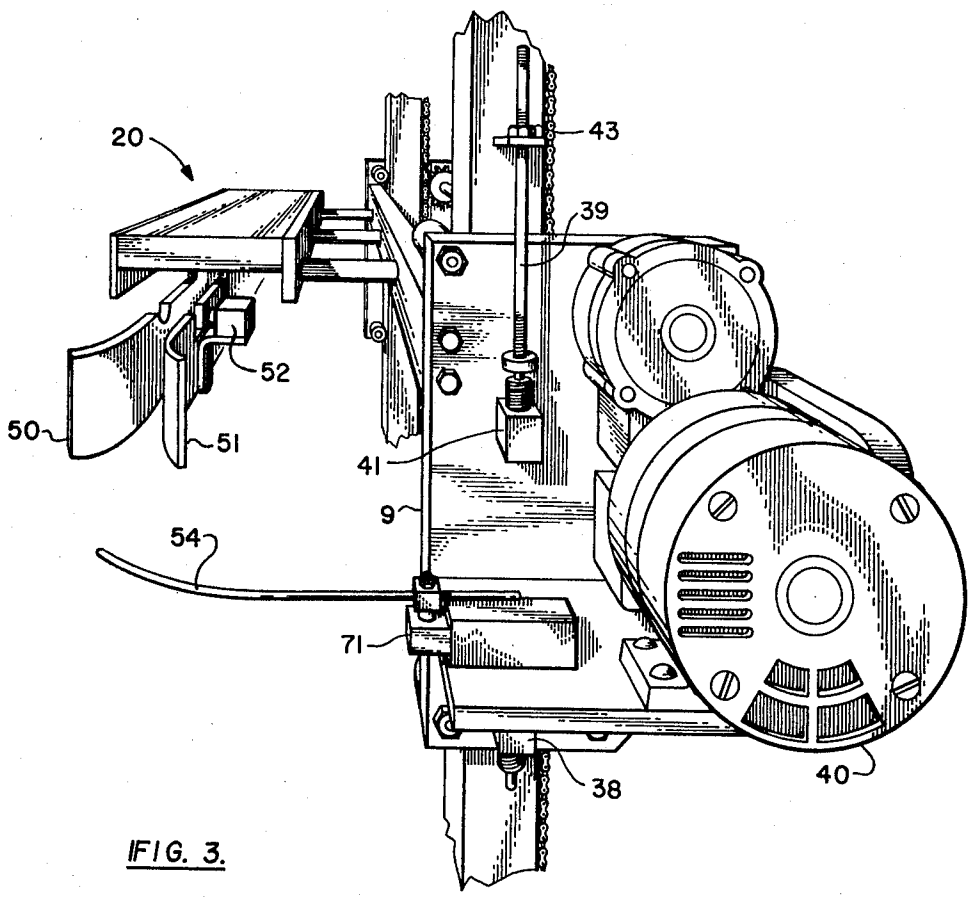


FIG. 3.

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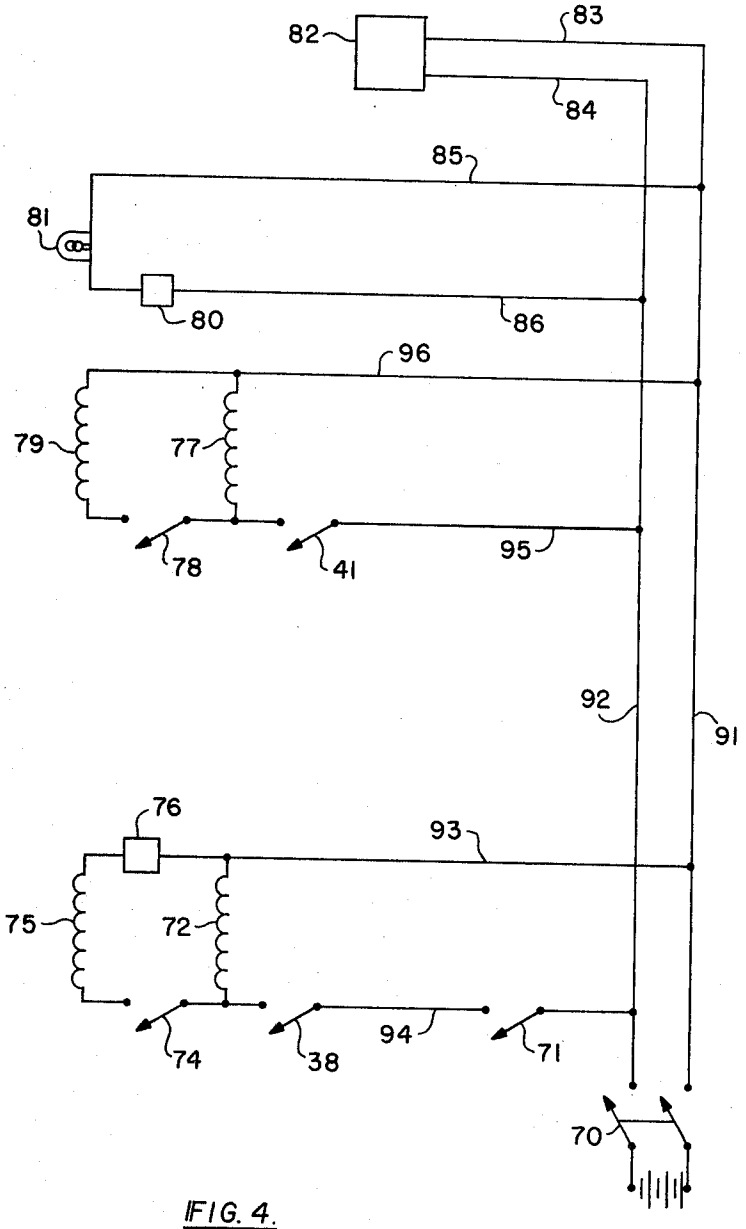


FIG. 4.

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AUTOMATIC BAG CLOSING MACHINE

SUMMARY OF INVENTION

This invention relates to a new and novel apparatus for folding and sealing the stepped end portion of a pinch-style bag to form a sealed bag top closure. More particularly, the invention relates to an improvement in a known apparatus for forming a sealed bag top closure.

The known apparatus on which the improvement disclosed in this invention has been applied, comprises the patented bag closing machine manufactured by Bemis Company and fully described in U.S. Pat. No. 3,381,448, to P. H. Ayres et al. In the Ayres patent, the type of bag on which the apparatus of the invention operates is described as being a multi-walled bag having stepped ends. These bags are generally referred to as pinch-style bags, and have a "step" on their open inner wall to which there is applied or pre-applied a hot melt adhesive. The patented sealing machine then takes the filled bag and folds over the stepped end while applying heat and pressure to seal the closure.

In the Ayres et al patent, a pinch-style bag is filled with product at an independent station and the top portion of the bag is folded so that the upper portions of the bag gussets and the side walls extend in a vertical condition upwardly above the product and with the side walls closely adjacent one another. With the thus filled bag on the conveyor, the bag is conveyed such that the leading edge is moved into an in-feed guide and then into the entry nip of a pair of in-feed belts whereby the belts conveyingly engage the side walls of the bag at a substantial distance below the open mouth of the bag but above the level of the product. At this time, the inner run of one entry belt abuts against the inner side wall of the bag while the inner run of the entry belt abuts against the outer side wall of the bag to hold the side walls in abutting relationship to each other or to the adjacent gusset panel. The bag is thus conveyed in a direction to have the leading edge portion thereof enter the entry nip between a pair of creasing rolls, which as the bag top portions move between said rolls, creases the bag top. The crease line thus formed is, of course, located at a lower elevation than the top edge of the bag side walls. Due to the shape of a creasing roll flange and a cooperating groove, the portion of the bag top above the crease line is bent to incline upwardly and transversely toward the left. As the creased portion of the bag top leaves the exit nip of the creasing rolls, it is longitudinally moved to a position to abut against a forward portion of the creasing flange which in part overlays the creasing roll and is inclined from above the creasing roll to extend upwardly and transversely to the left above the belt inner runs, so as to progressively fold the creased portion toward a general horizontal condition as the bag is further advanced. Slight additional movement of the leading edge portion of the bag beyond the exit nip of the creasing rollers brings leading edge portion of the bag into the throat formed by a folder blade portion and a shoe portion. The shoe has a horizontal top edge at substantially the same elevation as that of the crease line formed by the creasing rollers; and accordingly, the folding shoe folds the top bag portion about a general axis formed by the shoe top edge. That is, as the bag top passes beneath a central portion of the folder blade, the portion of the bag top above the crease line is folded to a generally horizontal condition.

Still further movement of the bag brings the bag folded edge portion into underlying relationship with the central portion of the folder blade and into overhanging relationship to a heating nozzle. As the folded portion of the bag top is moved over the heating nozzle, hot air is discharged through the apertures therein to impinge upon the bag folded portion and the adhesive to activate the adhesive, and to retain the horizontally folded portion of the bag adjacent the central portion of the folder blade. The adhesive is sufficiently activated by the time the bag has advanced longitudinally rearwardly of the nozzle, and as the leading portion of the bag is advanced to the rearward end portion of the folder blade, the rear blade portion begins to further fold the bag top about the crease line such that as the bag top leaves the rear end of the folder blade, the adhesive strips have been pressed into engagement with the bag side wall at a location below the crease line. Shortly after the leading edge portion of the bag leaves the trailing edge of the folder blade, the leading edge portion enters the entry nip between a pair of belts advancing the bag forward to a pair of compression rolls. The compression rolls hold the inner runs of the belts in sufficiently tight relationship that the dependingly folded portion of the bag top having the adhesive strips thereon is firmly pressed against the bag side wall at a location below the crease line to form a tightly sealed bag top closure. By the time the bag top leaves the exit nip between the compression belts, the adhesive has set sufficiently to retain the bag top in a folded, sealed condition.

It is also important to note that during the time that the machine is operating, hot air is continuously applied through a heating tube and discharged through nozzle apertures to impinge against the adjacent surface of the blade folder so that the blade folder remains heated throughout the sealing and closing operation. The heat retained by the blade folder thereby assists in activating the hot melt adhesive of the incoming bag. Also to be mentioned is the fact that the particular pattern of hot air discharged from the nozzle coincides with the pattern of hot melt adhesive on the bag top.

In addition thereto, it should be further noted that the heat sealing unit of Ayres et al. although described in use while forming a folded, sealed bag top closure on a gusseted type bag, could be used to form such a closure on a non-gusseted bag having a pair of side walls with a contiguous bottom and side edges joined to one another, and a top edge of one side wall extending above the top edge of the other side wall. With an upright non-gusseted bag, the adhesive strips would extend across the portion of the one side wall that extends above the other side wall.

Generally however, the bag closing and sealing unit, which has been improved by the invention disclosed herein is integrated with some type of bag forming and filling equipment as the final packaging step prior to loading and shipping the filled bags. For this purpose, the closing and sealing unit is arranged downstream of apparatus which forms and fills the bag with the desired produt. Such bag directing apparatus usually includes a bag conveyor which performs three functions, namely: (1) to grasp each bag along its top margin to support the same for filling; (2) to convey the bag into such filling station; and (3) to urge the mouth of the bag towards a closed condition prior to entering the closing

and sealing unit. The bags are supported throughout the forming and filling stage either along the top margins thereof or at the bottom via a conveyor. When granulated or pulverulent material is being bagged, it is usually preferable to use a filling and conveying means which grips and holds the bag by the upper margin thereof. As a result, the upper margin of the bag extending above the bag top is held open to accept the bag filling spout. The top conveyor thus holds the bag mouth in close contact with the filling spout to prevent the escape of dust laden air. The top conveyor maintains a firm grip on the bag mouth at all times and preferably has bag gripping surfaces of rubber or rubber-like material which prevents any appreciable slipping of the bag mouth relative thereto during insertion and withdrawal of the filling spout. Bag bottom supports also provided on the filling stations and are generally shaped to conform with the bag bottom in the desired attitude while the bag is being conveyed, filled and finally directed to the top closing means. The bottom of the bag may move slidably along the aforementioned bottom support means, and the bottom support may include a vibrating stage for the purpose of settling a charge as it is filled into the bag.

After the bag is properly filled it is then conveyed to the closing and sealing station by some sort of transfer section. Generally the transfer sections comprise paired endless belts which are mounted to extend in a horizontal plane and are pressed against one another by suitable means including for example rotatable pulleys. The adjacent portions of the endless belts preferably move along a straight line in a selected direction between the filling equipment and the closing and sealing equipment. The two endless belts are of substantially equal length and are stretched taut between one or more pulleys. At least one of the pulleys of the adjacent belts are mounted for rotation about an axis which can shift resiliently to accommodate the spreading apart of the adjacent belt portions in response to the insertion of a bag therebetween. Thus the belts progressively pull the bags therebetween from the filling equipment to the closing and sealing equipment.

Contemporaneous with the departing movement of the filled bag via the exit or downstream extremities of the endless belts, a fresh and empty bag is fed in timed relation into the entrance of the bag top conveyor whereby the upper margin of the bag is grasped as before described. Suitable timing means are provided for controlling in a preselected manner the sequence of the operations above described. Hence, what has been described above is a system which feeds the bags, fills the bags and transfers the bag toward the closing and sealing equipment which comprises the novel apparatus of the present invention.

The transfer system briefly described above is typical in nature and not deemed to be specific since for each installation, the transfer system required would represent a custom design. The apparatus of the present invention is intended for use both with existing and new apparatus for filling bags of the pinch-style type. When intended for use on existing apparatus, the transfer system would be specifically designed to grip the filled bags at a point slightly below the point normally engaged by the closing and sealing head. Of course, for new equipment the transfer system would be similarly oriented, but it could be made an integral part of the forming and filling equipment. In order to insure that the bag tops are properly aligned with the closing and sealing head inlet, it is necessary to arrange the transfer system slightly below the feed system for the closing and sealing head.

The bags, after being filled at the filling stage are in an open mouthed condition and remain so until each bag is conveyed to the transfer belts between the filling stage and the closing and sealing stage. Generally the bags may be either pre-applied with adhesive, or an adhesive applying station can be inserted near the leading edge inlet of the sealing head. Hence in commercial practice, the bags are usually filled with the product and then immediately conducted to the sealing operation. However, since the product rarely completely fills the bag, an excess of bag material is present between the mouth opening and the product. This excess material is generally referred to as the bag mouth whereas the filled region of the bag is referred to as the bag body.

The limpness of the material from which the bag is fabricated presents one common difficulty in sealing the bag mouth. As the bag mouth enters the bite of the sealing head, it tends to be retarded because it is unsupported, and hence as the bag continues to move, the region to be sealed is likely to become wrinkled. As a result, not only is the seal formed poor, but the package has an unsightly appearance. The transfer system previously described serves to overcome some of this problem by gripping the bag lower down on the mouth toward the filled body region thus keeping the gussets closed, but problems obtaining a proper seal still remain.

Therefore, it is an object of this invention to alleviate this and other difficulties, and toward that end, means is provided for not only maintaining the bag mouth in a taut condition as it enters the sealing head, but means is provided for orienting the sealing unit in a vertical plane to insure that the sealing unit is positioned at the proper height for the incoming bag to guarantee a good, effective seal. For this purpose, the bag closing and sealing machine described in U.S. Pat. No. 3,381,448 was modified to accommodate the vertical movement.

In the patent above referred to, the sealing unit was securely bolted to a stand so that the elements of the sealing apparatus remained a fixed distance above a conveyor assembly which supported the bottom of a filled bag as it was conveyed through the sealing apparatus. For the sake of this invention, the sealing unit is arranged to be compressively retained in a neutral position until such time that a bag to be sealed enters the sealing zone. At this particular time, the sealing unit is actuated to move downwardly a distance sufficient to meet and grip the bag for proper and efficient sealing.

Therefore, it is the primary object of the present invention to provide a modified apparatus for efficiently closing, folding and sealing the mouth of bags that have been filled with material by other apparatus not a part of the present invention.

It is a further object of this invention to provide a continuously operating apparatus of the type described wherein no maximum limitation is placed on the distance or time between the input of bags to the ap-

paratus, nor to the height or other orientation of the bag mouth in regard to the sealing equipment.

Another object of this invention is the provision of apparatus of the type described wherein the apparatus for operating on the bags is activated by the presence of the bag coming to the apparatus.

A more general object of the invention is to provide a sealing apparatus for closing bags which apparatus is capable of accomplishing its function regardless of the height of the filled bag above the conveyor so that the packages have a neat, uniform appearance and no wasted space is left between the top of the material in the bag and the sealed closure in order to minimize storage space, conserve bag material and reduce allowable bag distortion due to shifting of bag contents in the closed bags.

Further and more specific objects, features and advantages of the invention will more fully appear from the detailed description set forth below taken in connection with the accompanying drawing which forms a part of this specification and illustrates by way of example, the preferred embodiment of the invention.

DESCRIPTION OF THE DRAWING

FIG. 1 shows a perspective view partly in section of the front of the apparatus for resiliently mounting the sealing unit;

FIG. 2 illustrates a perspective view of the rear of the framework which resiliently mounts the sealing unit;

FIG. 3 shows a detailed view of the sensing apparatus for detecting the presence of an incoming bag to the sealing unit; and,

FIG. 4 is a wiring diagram illustrating the electrical connections which selectively sense the presence of an incoming bag and activate the vertical movement of the sealing unit.

DETAILED DESCRIPTION

The bag closing and sealing apparatus as modified by the present invention is designed preferably as a transportable item to be applied to existing forming and filling machinery. In this realm of use, the sealing unit or closer/sealer will replace conventional stitching and taping apparatus, and accordingly, to minimize the conversion costs, it is desirable to fit the sealing unit to existing filling machinery with as few changes as possible. Generally, because of the physical limitations present with most machinery, it is impossible to arrange the sealing unit in juxtaposition with the forming and filling machinery. Hence, a transfer unit is required as described hereinbefore with each installation to convey the filled bag from the forming and filling machinery to the bag closing and sealing unit. Of course, because of the differences in each machine, the transfer system must be custom designed for each installation. In particular, when the pinch-style bag is filled, and released from the filling station to be conveyed to the sealing unit, if the top of the bag is not held very tightly together, the bag side gussets tend to spread open (because of the filled condition) and this condition causes jams at the in-feed guides of the sealing unit. To counteract this condition, and to keep the gussets closed in the freeboard area above the contents, the transfer system proposed grasps the bag at a point that is lower than the sealing unit conveyor.

MOreover, in the machinery conversion from stitching and taping to pinch-style gluing of bags, certain other mechanical changes are necessary to accommodate the different style of bag. As a general rule, the pinch-style bag is longer than the stitched form of bag since the pinch-style bag must have an additional flap on the upper end thereof which is folded over and glued during the sealing step. In addition, the bottom of the pinch-style bag is formed differently from the stitched bag so that the filled pinch-style bag sets-up differently. Each of these factors contribute to the mechanical difficulties in converting existing machines.

On the other hand, the advantages of using the pinch-style bag system as opposed to the stitching and taping closure include increased strength, improved economy and more efficient top sealing formation. The strength of the pinch-style closure is derived from the quick setting and fast holding adhesives which are used. In addition, there is no need to put holes in the pinch-style closure whereas the sewing step of the stitched bag perforates the bag mouth as it is sewed shut. Also, the pinch-style only requires the application of a hot melt adhesive and a heating mechanism to close the bag mouth whereas the stitched bag requires sewing equipment and tape applying equipment thus costing more per bag to seal. It can also be shown that the pinch-style closure can be carried out considerably quicker than a stitched and sewn closure thereby allowing for a more automatic closure in less time resulting in more bags sealed in a given period of time.

Prior to the development of the present invention, the pinch-style system of closing bags comprised a manual operation wherein an operator took the filled bags coming from the filling station and manually fed the top of the bag into the in-feed guides of the sealing unit. This manual feed and closing operation is disclosed in the U.S. Pat. No. 3,200,558 to S. T. Adams et al. and assigned to the owner of the present application. Next, the patent to Ayres et al. (U.S. Pat. No. 3,381,448) was issued which described an improved system for closing and sealing pinch-style bags, and, of course, the present invention was developed as a further improvement on the Ayres et al. disclosure.

As noted hereinbefore, the filled bags as they are conveyed from the filling station, more often than not have unevenly disposed top portions, or they are otherwise disoriented so that the gussets are not closed and the mouth portions thereof are not suitably positioned to fit into the in-feed guides of the sealing unit. Further, the bags after being filled often assume positions on the conveyor such that their open mouths do not each rise to the same level thereby making it difficult to properly get the bags into the in-feed guides to effect a proper seal. Therefore, to accommodate the different conditions of the respective bags the sealing unit of Ayres et al. described hereinbefore, was resiliently mounted so as to be positionable at different heights to properly seal each bag as it was conveyed to be sealed.

In order to accomplish this result, the bag sealing unit **20** is resiliently mounted on a basic framework **10** by way of a pair of movable cross members **18, 19** for movement in a prescribed vertical plane. The movement of the sealing unit is precisely determined and controlled by an electrical system (FIG. 4) which senses the incoming filled bag **30** and automatically orients the sealing unit **20** to seal the bag mouth.

Since the preferred embodiment of the invention disclosed herein is particularly intended to be associated with already existing form-and-fill equipment, the sealing unit **20** is disclosed as being mounted on a framework **10** which can be moved into position downstream of the form and full equipment to seal the bags **30** in succession after they have been filled. For this purpose, the basic frame **10** for the sealing unit **20** comprises a pair of vertically oriented frame elements **13, 14** separated from one another by rigidly attached cross members **15** and including legs **16, 17** rigidly attached to the bottom portion of each frame element to give the framework stability in the setup condition. The leg members **16, 17** attached to each vertical frame element **13, 14** extend forwardly of the vertical frame elements a considerable distance so as to counterbalance the added weight of the sealing unit **20** which is attached to the front side of the framework **10** (FIG. 3) as set forth more fully hereinafter. Thus the basic mounting frame of this invention consists of a substantially rectangular framework **10** including a pair of vertical elements **13, 14** separated from one another by upper, lower and intermediate cross members **15** and including leg members **16, 17** extending horizontally and perpendicular to said vertical elements **13, 14** and attached to the lower end of each vertical member.

The mounting means for the sealing unit **20** comprises a pair of cross members **18, 19** which are arranged for relative vertical movement with respect to said basic framework. This scheme is carried out by arranging the two movable cross members **18, 19**, one above the other on the framework, but not physically attached to the framework except through a series of gears and rollers which precisely control the movement of cross members **18, 19** in the vertical direction. Each movable cross member **18, 19** has a pair of side brackets **21, 22** and **8, 9** fixed to the ends thereof for mounting the journals for the gears and rollers mentioned above. The upper and lower cross members **19** and **18** respectively are of a length equal to the distance between the outer side faces of the two vertical frame elements **13, 14** so that when the brackets **8, 9** and **21, 22** are attached to each end of the cross members, the brackets fit outside of the side faces of each vertical element **13, 14** of the framework **10**. The side brackets must also have sufficient width to project behind the back face of each vertical frame element **13, 14** and in front of the front face of each vertical frame element so that a support means can be arranged both forward of the vertical elements and aft of the vertical elements to thereby movably retain the cross members **18, 19** on the framework. For this latter purpose each cross member bracket **8, 9** and **21, 22** has a width which is substantially wider than the width of the adjacent vertical frame element **13, 14** and a length which is greater than its width. Thus journals can be added to the brackets **8, 9** and **21, 22** and aligned both in front of and behind the adjacent vertical frame element **13** or **14** to mount rollers or other mechanical elements for abutting the vertical frame elements both front and rear, and for retaining the movable cross members **18, 19** in a fixed plane with regard to the basic framework **10**. For this preferred embodiment, each vertical frame element **13, 14** has attached to the rear face thereof a section of roller chain **23** between a pair of retaining means **42, 49**, with said chain having short inner and outer links to define a relatively narrow pitch between the connecting pins and rollers. To cooperate with these roller chain sections **23**, toothed sprockets **7** and **24** are mounted in the upper rear portion of each cross member bracket **8, 9** and **21, 22** in journals provided therefor, and the sprockets **24** on the lower cross member brackets **21, 22** are connected to one another across the back of the framework by a connecting shaft **25** as are the sprockets **7** on the upper cross member brackets **8** and **9**. This arrangement of mechanical elements permits vertical movement of the movable cross members **18, 19** with respect to the framework **10** in precise and smooth intervals over a wide range.

Referring more particularly to the lower cross member mounting, the sprockets **24** and chain drive **23** are positioned so as to maintain the cross member **18** slightly spaced from and adjacent to the front face of each vertical frame element **13, 14**. In this manner, the lower cross member **18** extends across the basic framework **10** along the front face of the vertical frame elements **13, 14** and the sprockets **24** and connecting shaft **25** extends across the basic framework **10** along the rear face of the vertical frame elements **13, 14**. This relationship of parts renders the elements positively located for movement in a given vertical plane but because of the flexibility of the sprocket and chain mounting, there is a possibility that the cross member **18** might bind on the front face of the vertical frame elements. To offset this possibility, the journalled rollers **26** on the lower front part of each lower cross member bracket **21, 22** are added to offer a counteracting abutment point support. These rollers **26** are sized so as to locate the cross member **18** in slightly spaced relation with regard to the front faces of each vertical frame element. Therefore, the sprocket elements **24** and the roller element **26**, located respectively at the upper back corner and lower front corner of each lower cross member bracket **21, 22**, properly orients the cross member **18** in regard to the vertical frame elements **13, 14**. In addition to these elements, the lower cross member brackets **21, 22** each include a locking mechanism **27** on the lower rear portion thereof which is adapted to temporarily fix the lower cross member **18** in a rigid position when desired. The locking device **27** employs a threaded element with a suitable handle for gripping the associated chain section **23** to prevent relative movement. On the upper rear portion of one of the lower cross member brackets **21** or **22** there is located a drive means **45** associated with the adjacent sprocket **24** which permits the lower cross member **18** to be moved in its vertically oriented plane of movement. The drive means **45** comprises a worm and roller gearing device wherein the roller gear is attached directly to the sprocket **24** which rides in the associated chain section **23** and the worm gear has attached to it a manually driven handle **29**. Of course, hypoid gearing or any other form of right angle drive mechanism could be used if desired to accomplish the same purpose. The utility of having the lower cross member **18** capable of being oriented vertically is important where bags having drastically different heights are to be sealed. If, for instance, an order to fill and seal 100 pound bags, 20 inches in height were followed by an order for 50 pound bags, 15 inches high, it would be necessary to lower the entire sealing unit **20** to accom-

modate the new order. Hence the reason for employing a movable lower cross member in addition to the movable upper cross member should be obvious.

The lower cross member **18** also serves as the support base for the spring biased mount for the upper cross member **19**. For this purpose, a plurality of stub shafts **31, 32, 33** are rigidly attached to the upper face of the lower cross member **18** so as to extend vertically upward toward the upper cross member **19**. Since the two cross members **18, 19** lie in the same plane, a compression spring placed between the two cross members serves very nicely to maintain them spaced from one another. The suspension scheme is carried out by placing compression springs **34, 35, 36** of a larger inside diameter than the stub shafts **31, 32, 33**, around the outside of the stub shafts and so as to abut against the lower face of the upper cross member **19** to accept the upper ends of the springs and to thereby fix the compression springs in their vertical position between the two movable cross members **18, 19**.

IN addition thereto, the lower cross member **18** also has a down stop abutment **37** attached to one of the cross member brackets **21** or **22** which limits the amount of downward movement that the upper cross member **19** can make regardless of the compressive forces set up by the compression springs **34, 35, 36**. The downward movement limit stop **37** is adjustable manually for different bag runs via mechanism **44**, and is desirable as a safety factor to prevent overstressing of the compression springs and to insure that the motor for driving the upper cross member **19** and sealing unit **20** downwardly against the forces of the spring is not damaged. The downward movement limit stop **37** cooperates with a switch element **38** mounted on one of the upper cross member brackets **9** to engage the down limit stop abutment **37** when the upper cross member **19** is moved downwardly too far thereby turning off the driving motor **40**. Similarly, there is an up-limit stop **39** adjustable through mechanism **43**, mounted above the upper cross member bracket **9** which cooperates with an up-limit switch **41** to turn the driving motor off should the upper cross member move upwardly too far.

Referring now more particularly to the movable upper cross member **19**, several supports **2** are provided on the front face thereof for mounting the sealing unit **20** thereon. These supports are bolted to the backside of the sealing unit **20** and keep the sealing unit spaced from the basic framework **10** for movement in the prescribed vertical plane for sealing the bags. The construction of the upper cross member brackets **8** and **9** and the sprocket **7** and chain guide **23** are substantially the same as described hereinbefore for the lower cross member. The two sprockets **7** and their connecting shaft **6** are journalled in bearing supports located on the inside rear upper corner of each upper cross member bracket **8, 9**. The sprockets **7** are positioned to coincide with the roller chain sections **23** attached to each vertical frame member **13, 14** and the motor **40** for driving the sprocket gears **7** is attached to the upper cross member side bracket **9**. This motor is the driving element for positioning the sealing unit **20** in the proper position against the compressive forces suspension system located between the upper and lower cross members **18, 19**. The motor **40** for driving the gear system attached to the upper cross member sprockets **7** is reversible for movement of the sealing unit **20** either up or down in its vertical plane and it includes a reduction system and suitable right angle drive. Further, because the sealing unit **20** attached to the upper cross member **19** is very heavy and creates a large load on the basic structure, the rolling connection between the vertical frame members **13, 14** and the upper cross member brackets **8, 9** comprises rollers attached to each bracket both forwardly and rearwardly of the vertical frame members. The rollers are journalled in bearings attached to the brackets **8, 9** and the rollers are sized so as to abut against the front and rear faces of the vertical frame members **13, 14** to keep the upper cross member **19** from frictionally engaging the vertical frames members.

Thus the mounting system described hereinabove is designed for accepting the sealing unit as claimed in U.S. Pat. No. 3,381,448 and allows it to be displaced in a vertical plane to accommodate bags of different heights on the conveyor system. The scheme whereby the height of the sealing unit is positioned above the conveyor is determined by the electronic sensing system described hereinafter.

The sealing unit **20** includes, as an integral part thereof, a pair of plates **50, 51** which extend longitudinally from the leading end of the machine to serve as in-feed guides for accepting and directing the open mouth portion of the filled bag **30** into the sealing unit **20** itself. To carry out the automatic setting feature of the invention, a sensing device **52** in the form of an electric eye is included on the upper edge of the in-feed guides **50, 51** to sense the presence of an incoming bag and orient the height of the sealing unit **20** with the top of the incoming bag. In addition, a mechanical sensing device in the form of a lever **54** which engages the incoming bag **30** is added to the motor mount attached to the upper cross member side bracket **9**. Consequently, with reference in particular to FIG. **4** of the drawing, the apparatus functions as follows, when the presence of a filled bag is detected, to properly orient the sealing unit **20** for sealing a bag **30**. When a filled bag **30** riding on the conveyor **60** approaches the sealing unit **20**, the mechanical tripping device **54** is encountered and movement of the tripping device **54** closes the bag switch **71** to turn on the driving motor **40** for positioning the sealing unit **20**. In the preferred embodiment of the invention, the sealing unit **20** is maintained in a neutral position between sealing operations, i.e., between bags, which is at a height that is higher than any bag would normally be for the size bags being sealed. This position is determined for each bag order and the height adjustment is carried out by manually adjusting the mechanism **43** on up-limit stop **39** which contacts the motor operate switch **41** in the neutral position. Thus with the sealing unit located in its neutral or upper position, it would be ready for accepting the delivery of bags to be sealed. Closure of on-off switch **70** would activate circuit **91, 92** and through circuit **83, 84**, the electric eye control box **82** would be enabled. Similarly, the circuit **85, 86** would be activated thereby turning on electric eye switch **80** and indicator light **81**. With the sealing unit **20** in its uppermost position, the up limit switch **41** would be open and the timer switch **78** open so that activation of circuit

95, 96 would not actuate the up starter coil 79. For the circuit 93, 94, the down limit switch 38 would be closed, bag switch 71 open and timer switch 74 open. Therefore in the ready position, the down starter coil 75 would also be not actuated. However, with the presence of a bag 30 at the mechanical lever 54 to close bag switch 71, the timer coil in circuit 93, 94 would be activated so as to close the timer switch 74 and thereby activate the down starter coil 75. Simultaneously, the down starter coil 75 would turn on the driving motor 40 to thereby start the downward motion of the sealing unit 20 for sealing the incoming bag 30. As the upper cross member 19 and sealing unit 20 are being driven downwardly, the bag 30 would come into range and enter the in-feed guides 50, 51. When the electric eye 52 located on in-feed guide 51 sights the top of the incoming bag, the beam of the electric eye is broken which opens the eye switches 76 and 80. In circuit 85, 86, this causes the indicator light 81 to go out. Meanwhile in circuit 93, 94, the broken circuit at eye switch 76 deactivates the down starter 75 to stop the downward movement of the sealing unit. This is desirable, of course, so that the sealing unit remains in a fixed position until the bag passes through the sealing unit and is satisfactorily sealed. Simultaneously, the opening of eye switch 76 causes timer switch 74 to be opened and bag switch 71 to be opened and in readiness for a subsequent bag. Of course, during this same time period the timer coil 77 is being charged, and, after a sufficient time has passed for the bag to be sealed by the sealing unit 20, the timer switch 78 is closed to activate the up starter coil 79 thereby reversing the motion of driving motor 40 and the direction of movement of the sealing unit 20. Accordingly, the cross member 19 and sealing unit 20 are then driven back up to the neutral position which is either determined by the position of up-limit stop 39, which encounters the up-limit switch 41 to stop the upward movement, or the time delay factor built into timer switch 78 which would stop the upper movement when automatically opened. Of course, it is not necessary in all instances that the sealing unit 20 remain in a fixed position as the bag passes therethrough. Depending upon the space between the bags being sealed, it could be possible to have two bags in the sealing unit at the same time. Thus the sealing unit need only remain at its sensed position until the bag is gripped by the closing unit in-feed belts. Subsequently, the sealing unit would then reset to the neutral position in readiness to sense another bag.

As set forth hereinbefore, the sealing unit 20, as mounted on the movable upper cross member 19, is counter balanced or maintained in its normal or neutral position by the suspension system or compression springs 34, 35, 36 located between the upper and lower cross members 18, 19. The counterbalancing is carried out by manually turning the mechanism on the movable lower cross member to position the lower cross member, then locking the lower cross member in the desired position. Hence, the motor for positioning the sealing unit must drive the upper cross member and sealing unit downwardly against the compressive forces generated by the springs. This arrangement insures that the sealing unit will stay more-or-less in a given position without movement between the arrival of filled bags. In addition, because the sealing unit is always biased in the up position against the pressure of the springs, when the motor is driving the unit either up or down, the movement of same will be steady and continuous without interruptions and unusual jerks.

Thus what has been described herein is a mounting system for a known type of bag sealing unit whereby the bag sealing unit becomes more versatile and reliable than the standard rigid mount provided therefor. The novel mounting means described herein is designed to accommodate a pinch style bag sealing system and to replace automatic stitching and taping closures presently being used and to replace the known type of manually fed bag sealing machines that are still being used in some instances.

I claim:

1. Apparatus for closing and sealing the top of pinch-style, multi-wall bags of slightly varying height comprising in combination:

a. a supporting structure and a sealing unit, said supporting structure including a framework with vertically movable upper and lower cross members mounted thereon, said sealing unit being rigidly mounted on said upper movable cross member for vertical movement with respect to the supporting structure and the lower movable cross member;

b. means for fixing the vertical position of the lower movable cross member in a desired position with regard to said framework;

c. a resilient suspension means for positioning the upper movable cross member with respect to the lower movable cross member on said framework;

d. a drive means rigidly mounted on said upper movable cross member for drivingly positioning the upper movable cross member and the sealing unit against the force of said resilient suspension means with respect to the lower movable cross member on the framework; and

e. a sensing means associated with the sealing unit and the upper movable cross member for sensing the presence of a bag to be sealed and for actuating the vertical movement of said upper movable cross member and the sealing unit with respect to said lower movable cross member and the supporting structure for intercepting and sealing the bag, said sensing means including a first device for detecting the presence of a bag to be sealed, and a second device for determining the height of the bag to be sealed whereby actuation of the first device initiates the operation of the drive means for moving said sealing unit on the framework into a position for accepting the bag to be sealed, and actuation of said second device stops said drive means to position the sealing unit on said framework for sealing said bag.

2. The apparatus of claim 1 wherein said first device comprises a mechanical tripping element which intercepts an incoming bag to said sealing unit.

3. The apparatus of claim 2 wherein said second device comprises an electric eye which sights the top of a bag in said sealing unit.

4. Apparatus for closing and sealing the top of pinch-style, multi-wall bags of slightly varying height comprising:

a. A supporting structure consisting of a framework formed by a pair of vertically oriented frame ele-

ments separated from one another by rigidly attached cross members, said supporting structure further including a pair of additional movable cross members mounted one above the other for vertical movement with respect to the framework, said movable cross members having brackets attached at each end thereof for movably attaching the additional cross members on said framework;

b. means for temporarily fixing the vertical position of the lower movable cross member with respect to said framework;

c. a suspension means between the lower movable cross member and the upper movable cross member for resiliently positioning the upper movable cross member with respect to the lower movable cross member;

d. a bag sealing unit rigidly mounted on said upper movable cross member for vertical movement with respect to said framework and said lower movable cross member;

e. a drive means rigidly attached to said upper movable cross member which drivingly positions the upper movable cross member and the bag sealing unit against the force of said resilient suspension means between said upper moveable cross member and the lower movable cross member on the framework; and,

f. a sensing means associated with said bag sealing unit for sensing the presence of a bag to be sealed and for actuating the drive means attached to said upper movable cross member to position said sealing unit for intercepting, closing and sealing pinch-style, multi-wall bags of slightly varying height, said sensing means including a first device for detecting the presence of a bag to be sealed, and a second device for determining the height of the bag to be sealed.

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